# New Sensor Demonstrates Rapid and Cost Efficient Collection and Analysis of VOC's in Groundwater at NAS Whiting Field

NFESC Code 413 and the Naval Facilities Engineering Command's Southern Division conducted a demonstration of the Army Corps of Engineers Hydrosparge VOC Sensor at Naval Air Station (NAS) Whiting Field.

**Figure 1 - Cone Penetrometer Rig**

The new sensor deployed on a Cone Penetrometer (CPT) (Figure 1) is used for collection of Volatile Organic Compounds (VOC's) in groundwater. It successfully demonstrated rapid collection and cost effectiveness for characterization of a VOC contaminated groundwater plume. The Sensor probe as shown in Figure 2, is a collection of functional parts and depends largely on the In-Situ Sparge Module. This module is delivered in a small diameter, temporary ground-water well or sampling probe found on many types of Direct Push technologies. Helium gas is used to drive the VOCs out of the water and into the purge chamber. This is analogous to SW-846 sample preparation method 5030A. The VOCs are then siphoned into the Direct Sampling Ion Trapping Mass Spectrometer (DSITMS) which is located above ground. The DSITMS and the In-Situ Sparge Module were developed by Oak Ridge National Laboratory (ORNL). The Army Corps of Engineers Waterways Experiment Station is fielding the Hydrosparge VOC Sensor probe and performing validation testing as part of the tri-service Site Characterization and Analysis Penetrometer System (SCAPS).

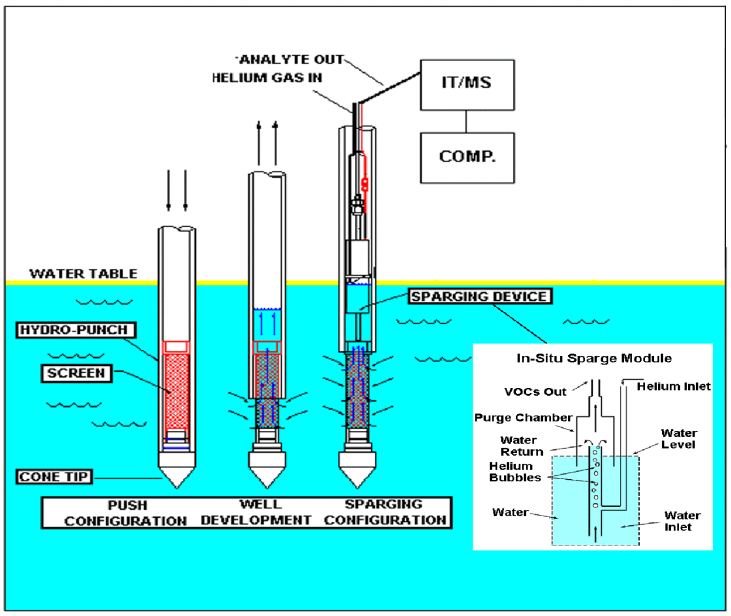


**Figure 2 - Hydrosparge Schematic**

<u>Procedure</u> The procedure consisted of first pushing a conventional Cone Penetrometer probe into the ground to define soil stratigraphy and dynamic pore pressure. Water sample

collection depths were then chosen from zones that had permeable soil types and lower pore pressures to assure adequate sample volume. A second push was then completed with the Fugro™ water sampler to provide access to ground water. This device has 18 inches of screen that can be exposed once the depth of interest is reached. A separate push was completed for each water sample collection depth. Once the water sampler screen area was exposed, the water began to fill the push rods and its level was monitored until it stopped increasing. The In-Situ Sparge Module was then carefully lowered down the push rods until it reached the water. The Hydrosparge analysis lasted for approximately 5 minutes. After the analysis was complete, a bailer was used to collect water samples from within the push rods for off-site analysis using traditional laboratory methods.

The demonstration resulted in the completion of 15 CPT soil stratigraphy pushes and installation of 17 temporary ground-water wells. A total of 4840 linear feet were pushed in thirteen days for an average of 372 feet per day, and an average single push depth of 151 feet below ground surface. A total of 11 ground-water samples were analyzed using the Hydrosparge VOC Sensor probe and 16 ground-water samples were collected for off-site analysis. Comparing the Hydrosparge and the off-site analysis results by linear regression yields a coefficient of determination ($r^2$) of 0.88. This shows good agreement between the on-site, in-situ analysis and the off-site, fixed laboratory analysis. It should be noted that Hydrosparge and soil stratigraphy results were available real-time.

Use of Hydrosparge and CTP resulted in a cost avoidance of approximately $50,000 when compared to the estimated cost of completing the objectives using conventional monitoring wells.

For more information please contact DSN 551-6258 or DSN 583-5561.